SECTION 1036

REINFORCING STEEL FOR CONCRETE

1036.1 Reinforcing Steel for Concrete Structures.

1036.1.1 Unless otherwise specified, reinforcement shall be deformed bars meeting the requirements of one of the following: AASHTO M 31, AASHTO M 42 or AASHTO M 53. Bars conforming to AASHTO M 42 and M 53 shall be in straight lengths only.

1036.1.2 Spiral reinforcement shall conform to the requirement for reinforcing steel bars, except that the reinforcement may be plain or deformed or shall be cold drawn steel wire conforming to the requirements of AASHTO M 32 or deformed steel wire conforming to the requirements of AASHTO M 225.

1036.1.3 Welded steel wire fabric shall conform to requirements of AASHTO M 55 or AASHTO M 221.

1036.2 Steel Wire Fabric for Concrete Pavement. Welded steel wire fabric reinforcement for concrete pavement shall meet the requirements of AASHTO M 55 or AASHTO M 221, except the requirements for weld shear tests and the variation of diameter of transverse wires shall be waived. The wire fabric shall be in mats of the size and design shown on the plans. It will be permissible to furnish longitudinally hinged wire fabric for sheets of a required width of 8 feet (2.5 m) or greater. The hinge shall be made by looping the transverse wires around a longitudinal wire and shall be capable of developing the full strength of the transverse wire. The hinge shall be located within one foot (300 mm) of the center of the width of the sheet. All steel wire fabric shall be free from dirt, paint, oil, grease, thick rust and other foreign substances. Thin powdery rust need not be removed.

1036.3 Epoxy Coated Reinforcing Steel.

1036.3.1 The steel shall be deformed reinforcing bars meeting the requirements of AASHTO M 31, AASHTO M 42 or AASHTO M 53. Bars conforming to AASHTO M 42 and M 53 shall be in straight lengths only.

1036.3.1.1 The contractor and the coating applicator shall determine the actual lengths of bars to be shipped for coating. The coated bar lengths delivered to the construction site shall be as shown on the plans. Additional bars as indicated in the bar bill for each bridge shall be furnished and coated for testing purposes. These additional bars shall not be used by the coating applicator for tests but are to be furnished to the project as an integral part of the total shipment of coated reinforcing steel.

1036.3.2 Inspection of Uncoated Steel.

1036.3.2.1 If the contractor obtains the uncoated steel from a source where the engineer normally performs inspection of reinforcing steel, the engineer shall be notified when the steel is ready for inspection and the steel will be inspected and approved prior to shipment to the coating applicator.

1036.3.2.2 If the contractor obtains the uncoated steel from a source where the engineer does not normally perform inspection, the steel may be inspected and sampled at the coating applicator's plant prior to coating, by the engineer or representative, if the engineer so elects. In such case the engineer or representative will sample each heat and each bar size for testing. Each heat is to be properly identified by the steel manufacturer by a means such as tagging bundles or bars of each heat with the heat number. Steel that cannot be identified by heat number and source will not be inspected or accepted.

1036.3.2.3 The engineer will inspect and sample the steel at the project site if inspection was not performed at the steel mill or at the coating applicator's plant. Samples taken at the project site for testing of steel properties will be taken at the same time as samples of the coated steel and will be from the bar size and shape listed on the bar bill that includes additional bars for testing. If any bar fails to meet all requirements for reinforcing steel, all bars of that size in the total quantity will be rejected. No additional bars will be taken for destructive testing unless requested by the contractor and no additional payment will be made for bars taken for retest. If the shipment is retested, double the number of bars taken for the original tests will be selected. All samples taken for retest shall meet all requirements or all bars of that size in the total quantity will be rejected.

1036.3.2.4 Regardless of where the steel is sampled, the contractor shall furnish in triplicate a copy of the steel manufacturer's certified mill test report showing concrete chemical and physical test results for each heat.

1036.3.3 Coating Process. The epoxy powder may be applied by the electrostatic spray or electrostatic fluidized-bed method to either a hot or cold bar. The coated bar shall be given a thermal treatment specified by the manufacturer of the epoxy resin which will provide a fully cured finished coating.

1036.3.4 Coating Material.

1036.3.4.1 The coating material shall be a powdered epoxy resin which has been approved by the engineer. An approved list of epoxy resins is maintained by the Division Engineer, Materials. The powdered resin shall be of the same material, quality and formulation as that approved for use by the engineer.

1036.3.4.2 The contractor shall furnish the engineer three copies of the manufacturer's certification that the material supplied to the coating applicator conform to these specifications. The manufacturer of the epoxy resin shall supply to the coating applicator information on the resin that is considered essential to the proper use and performance of the resin as a coating. Acceptance of the coating material will be based on the manufacturer's certification and results of any tests deemed necessary.

1036.3.5 Patching Material. Patching or repair material, compatible with the coating and inert in concrete, shall be as recommended by the epoxy resin manufacturer. The material shall be epoxy and must be suitable for application at the plant or in the field to uncoated areas and damaged areas of the coating.

1036.3.6 Surface Preparation. The surface of bars to be coated shall be clean and free from rust, scale, oil, grease and similar surface contaminants. The surface shall be blasted to a near white metal in accordance with the Steel Structure Painting Council Surface Preparation Specification SSPC-SP10. All traces of grit and dust from the blasting shall be removed. The coating shall be applied to the cleaned surface as soon as possible after cleaning, before visible oxidation of the surface occurs and not more than 8 hours after cleaning unless otherwise approved by the engineer.

1036.3.7 Coating Thickness.

1036.3.7.1 A film thickness after curing of 5 to 12 mils (130 µm to 300 µm) shall be applied in a uniform, smooth coat. Thickness of the film shall be measured, by the applicator, on a representative number of bars from each production lot, in accordance with ASTM G 12.

1036.3.7.2 The coating film shall be fully cured. A representative proportion of each production lot shall be checked by the coating applicator, using the method found most effective for measuring cure, to ensure that the entire production lot of coating is supplied in a fully cured condition.

1036.3.8 Continuity of Coating.

1036.3.8.1 The coating shall be checked visually after cure for continuity of coating and shall be free from holes, voids, contamination, cracks and damaged areas. In addition, there shall not be more than two holidays (pinholes not visually discernible) in any linear foot (meter) of the coated bar.

1036.3.8.2 The coating applicator shall use an in-line holiday detector with an alarm device in accordance with the manufacturer's instructions to check the coating for holidays. A 67 1/2-volt detector such as the Tinker and Rasor Model M-1 or its equivalent shall be used. If approved by the engineer, a portable holiday detector will be permitted.

1036.3.9 Flexibility of Coating. The coating applicator shall perform the flexibility of coating test on a representative number of bars selected from each production lot. The coated reinforcing bars shall be capable of being bent 120 degrees (after rebound) around a mandrel without any visible evidence of cracking of the coating, except that very minute hairline cracks, with no evidence of disbonding, at the base of the deformation will be permitted. The mandrel shall have a diameter specified in AASHTO M 284. The bend shall be made at a uniform rate of speed and may take up to one minute to complete. The two longitudinal deformations may be placed in a plane perpendicular to the mandrel radius. The bending test shall be conducted at room temperature after the specimen has been exposed to room temperature for a sufficient time to ensure that the specimen has reached thermal equilibrium. A temperature in the range of 68 to 85 F (20 to 30 C) shall be considered room temperature. The fracture or partial failure of the steel reinforcing bar in the bend test for flexibility of coating will not be considered as a failure of flexibility of coating. Additional bars may, however, be required for testing and evaluation of flexibility of coating.

1036.3.10 Inspection and Testing.

1036.3.10.1 The contractor shall inform the engineer, in writing, at least ten days prior to performing any of the cleaning or coating operations.

1036.3.10.2 If the engineer so elects, the preparation, coating and curing of the bars and testing for coating thickness, continuity and flexibility shall be done in the engineer's presence. The engineer shall have free access to the shop for inspection and every facility shall be extended to the engineer for this purpose. On a random basis, lengths of coated bars, other than the additional test bars, may be taken by the engineer from the production run at the point of coating application, for non-destructive test, evaluation and check purposes.

1036.3.10.3 In lieu of shop inspection, the engineer may elect to perform all sampling and testing at the project site. On a random basis, lengths of coated bars will be taken by the engineer from the total quantity at the project site, for test, evaluation and check purposes. The engineer will perform testing for holiday detection on bars selected at random and the contractor shall provide personnel for such items as handling steel. Destructive sampling and

testing will be limited to the number of bars furnished as additional bars for testing in accordance with Sec 1036.3.1.1. If any bar fails to meet all the above specified tests, all coated bars of that size will be rejected. No additional bars will be taken for destructive testing unless requested by the contractor and no additional payment will be made for bars taken for retest. If the shipment is retested, double the number of bars taken for the original tests will be selected. All samples taken for retest shall meet all requirements or all bars of that size in the total quantity will be rejected.

1036.3.10.4 Regardless of where inspection and testing is performed, the contractor shall furnish to the engineer the coating applicator's certification in triplicate, certifying that all material used, the preparation of the bars, coating and curing conform to the requirements of these specifications and that no bar contains more than two holidays per linear foot (300 mm). The certification shall include or have attached specific results of tests of coating thickness and flexibility of coating.

1036.3.11 Shipping. All systems for handling epoxy coated bars shall have padded contact areas. Coated bars shall be prepared for shipment by use of excelsior or equivalent padded metal bands or other methods which will prevent damage during shipment. If bundled together for shipment, the bundles shall be small, tightly banded with padded bands and shall be lifted in a manner to prevent bar abrasion in the bar bundle and shall be stored on padded supports.